Metabolomics profiling of a strawberry (*Fragaria* x *ananassa*) F1 population to characterize flavour and nutritional traits

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INTRODUCTION

The cultivated strawberry (*Fragaria* x *ananassa*) is a highly consumed fruit known for its delicate flavour and nutritional characteristics. However, as fruit quality attributes have been lost after years of traditional breeding, new technological tools, such as high throughput metabolomics, are necessary for the identification of factors responsible of these traits. Here we present the metabolomics profiling for the content of primary and secondary metabolites of a 95 F_1 individuals strawberry population derived from genotype "1392", selected for its superior flavour, and "232" (Zorrilla-Fontanesi et al., 2011; Zorrilla-Fontanesi et al., 2012).

Metabolite profiling was performed on mature fruits of the strawberry population using gas chromatography hyphenated to time-of-flight mass spectrometry for primary metabolites and ultra performance liquid chromatography Exactive Orbitrap tandem mass spectrometry for secondary metabolites.

RESULTS

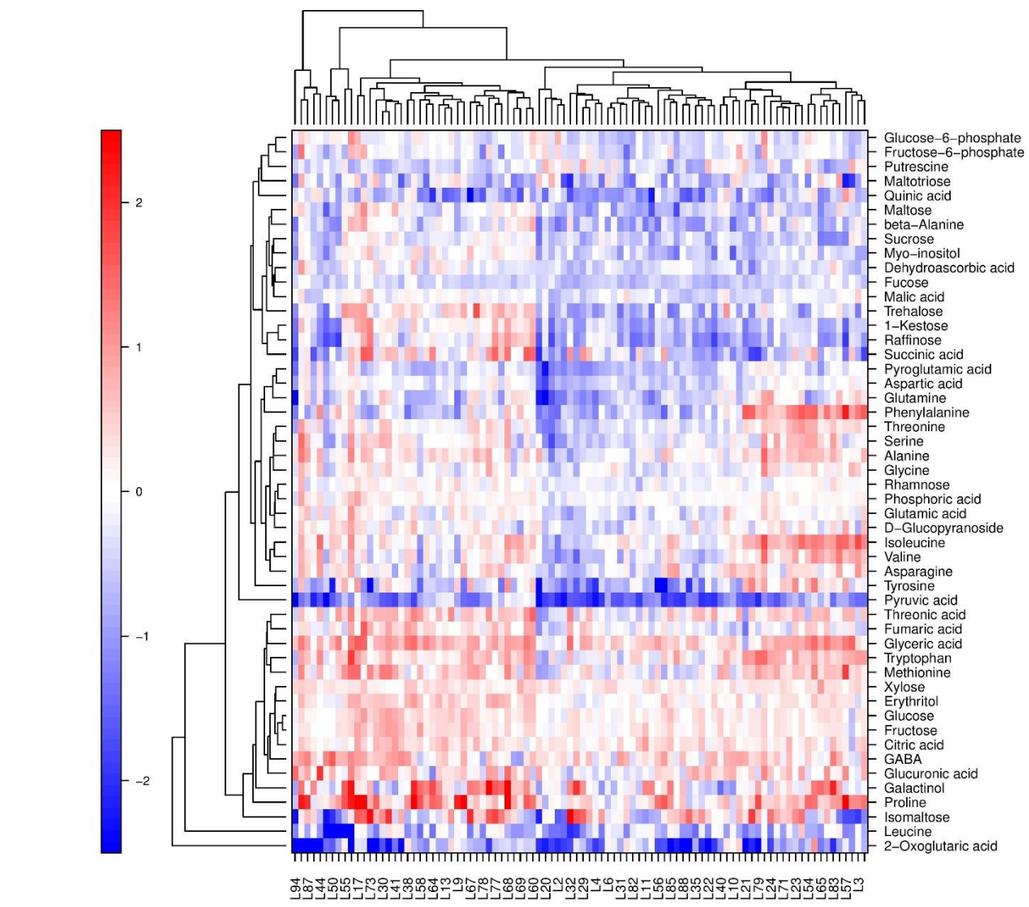

Figure 1. Heat map representating the mean value of the levels of primary metabolites in the '232 x 1392' strawberry population in the harvests 2013 and 2014. Metabolites and population's lines are grouped by clusters, using Pearson's coefficient. Values are representated as the fold change relativized to the '1392' parental. Lowest levels of metabolites are represented in blue, highest levels in red.

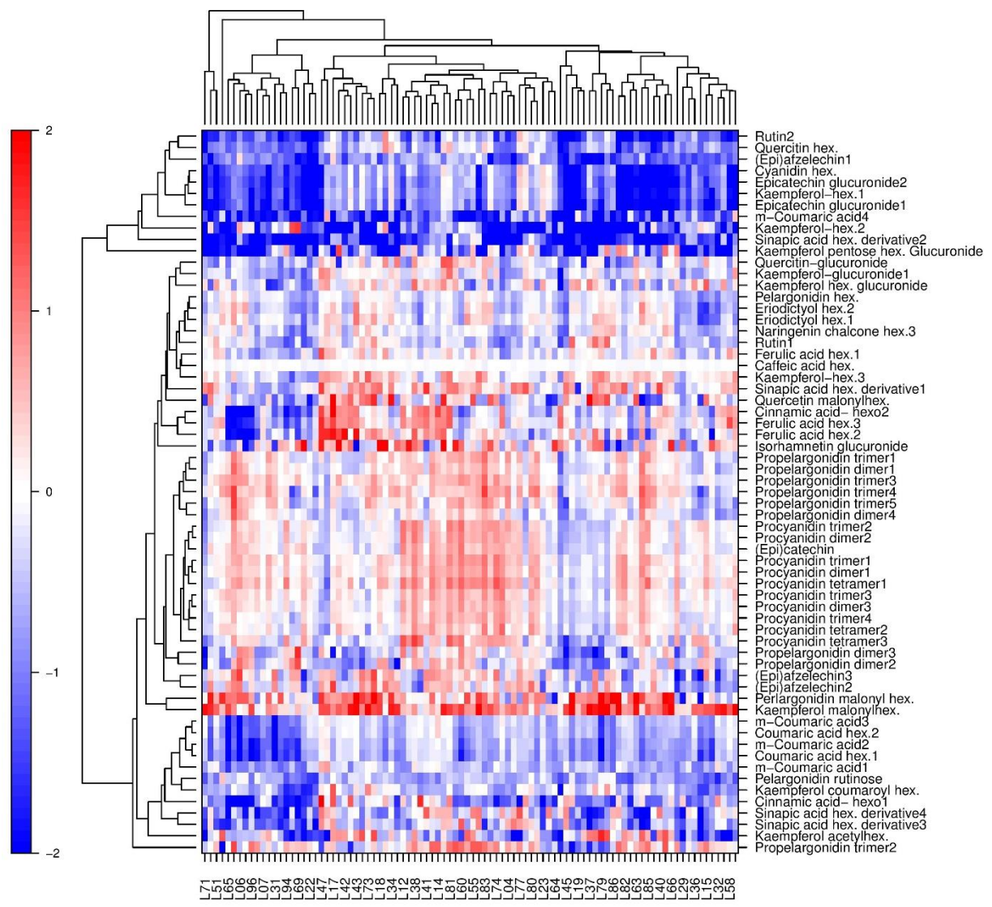

Figure 2. Heat map representating the mean value of the levels of the main class of secondary metabolites (flavonoids) in the '232 x 1392' strawberry population in the harvests 2013 and 2014. Metabolites and population's lines are grouped by clusters, using Pearson's coefficient. Values are representated as the fold change relativized to the '1392' parental. Lowest levels of metabolites are represented in blue, highest levels in red.

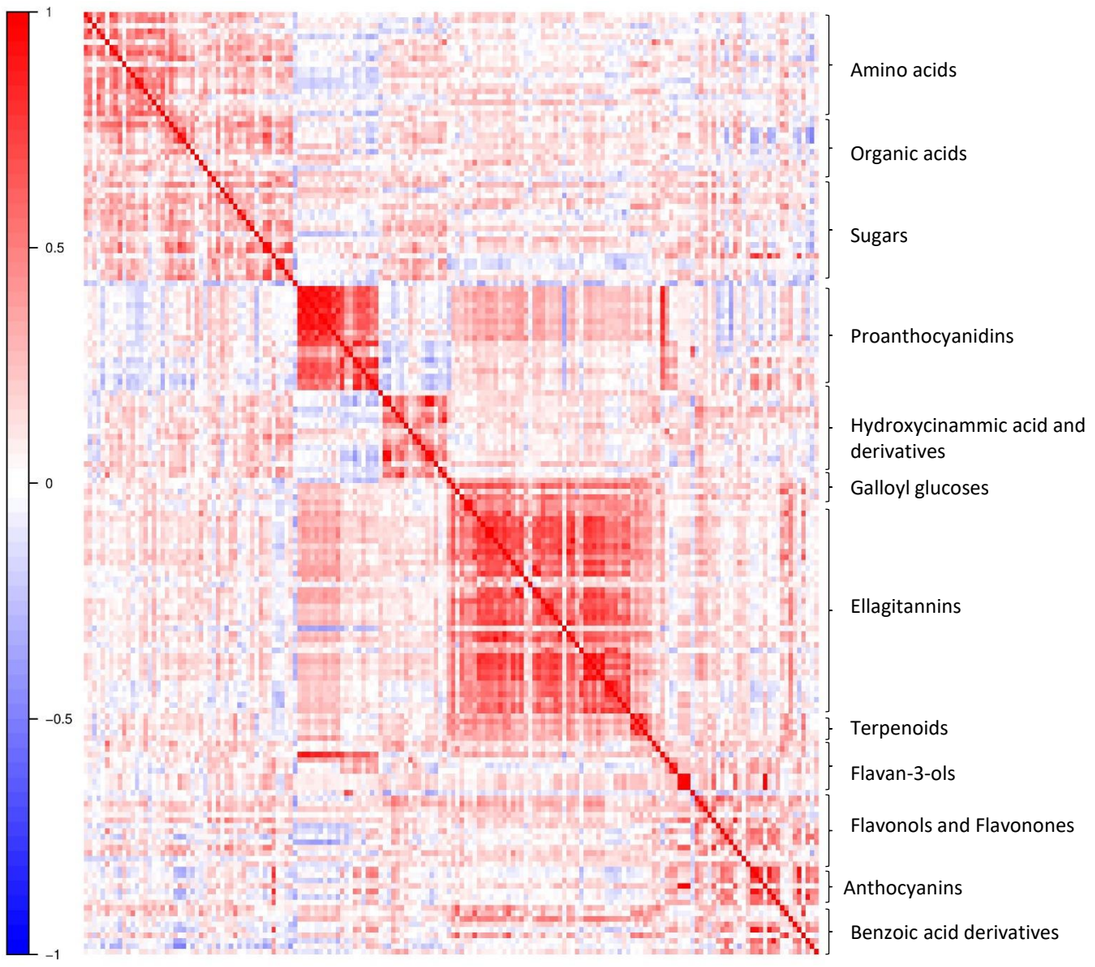

Figure 3. Heat map of metabolites-metabolites correlation in the '232 x 1392' strawberry population. Correlation coefficients were calculated with Pearson algorithm. Dark blue squares indicate a negative correlation and dark red squares a positive correlation.

CONCLUSION

- Primary metabolites include **sugars** and **acids**, which are directly responsible of the **taste** perceived by the human sensory system. In addition, they are precursors for secondary metabolites, including **volatiles**, which confer to strawberry its delicate **aroma**.
- **Phenolic compounds**, which are synthesized via phenylalanine and the phenylpropanoid pathway, are the main class of secondary metabolites in strawberry fruits. They are essential constituents of human diet because of their **antioxidant** function.
- A **quantitative trait loci mapping** has been performed with the results of the metabolomic profiling of the '232 x 1392' population, in order to find **candidate genes** which influence the levels of metabolites involved in strawberry quality traits.

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References
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